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COMMERCIALIZATION OF RESEARCH RESULTS IN MALAYSIA - A NATIONAL PERSPECTIVE*

Prepared by**

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** Standards and Industrial Research Institute of Malaysia and Ministry of Science, Technology and Environment, Malaysia.

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1. INTRODUCTION

The main objective of this paper is to outline the status of the commercialization of research results by research organizations in Malaysia in general, and in particular, to highlight the perspective developments of the Standards and Industrial Research Institute of Malaysia (SIRIM) as a pioneer institute supporting industrial development through R & D*. Commercialization of technology is meant to cover the means, methods or systems applied by an organization to market or transfer in a commercially viable manner, technologies indigenously developed by it or acquired and adapted from outside sources, for utilization by the local industrial sector.

2. THE DEVELOPMENT OF R & D INSTITUTIONS IN MALAYSIA - TRENDS

Historically R & D institutions in Malaysia were established on the basis of the then existing socio-economic development trends of the country. Most of the major R & D institutions in the country are either government funded or funded by collection of cess from the targetted industries that the R & D institutes are set up to serve.

The first industry-oriented R & D institute to be established was the Rubber Research Institute of Malaysia (RRIM) in 1925, to support rubber cultivation practices in the country. Its research is financed by a cess collected on every ton of rubber produced,

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* Research and Development

and research projects are concentrated on all aspects of rubber cultivation, latex production, development of new forms of rubber and consumption trends, as well as technological and end-use research in the processing and manufacture of natural rubber products.

In 1929 the Forest Research Institute (FRI) was established to support the timber industry with R & D, on planning for forest conservation, utilization schemes, feasibility studies on reforestation schemes, research into industrializing of large scale forestry-based industries and farming new species of trees that will contribute to a continuous supply of raw materials.

The two research institutes above were tailored to assist the development of the specific industries as rubber and timber were two of the three (tin being the third) major revenue earners for the country prior to the 1960's.

In 1970's the government adopted the economic strategy to diversify its activities into the cultivation of other crops. This led to the establishment of the Malaysian Agricultural Research and Development Institute (MARDI) in 1969. This institute conducts research into other agricultural crops apart from rubber. In the late 1970's palm oil became prominent as a major revenue earner for the country and in 1979 the Palm Oil Research Institute of Malaysia (PORIM) was established. Research on palm oil was initially conducted in MARDI prior to 1979 but in view of the increasing acreage of oil palm being cultivated(in 1980 about 1.04 million

hectars) it was thought that the thrust given to this crop and its products by a branch of MARDI which is also dealing with other crops, would not be equally effective. This institute's activities are financed by cess, and research projects include those on oil palm cultivation, breeding through selection, agronomic studies and end-use research.

In the late sixties and the seventies there was a concentration of efforts by the government to boost industrialization and to give priority to import substitution industry and agro-based industry. In 1969 the Standards Institution of Malaysia (SIM) was established and was closely followed in 1971 by the National Institute for Scientific and Industrial Research (NISIR). The aims of both institutes were to promote and foster product development and downstream development of resource-based industry thus enhancing government's efforts to encourage industrialization.

In 1975 SIM and NISIR merged to form the national industrial research institute called the Standards and Industrial Research Institute of Malaysia (SIRIM). The main objectives of this institute are to provide scientific and technological support to the industrial development of the country. Its activities include technology transfer, extending industrial consultancy to the industry and providing technical assistance through scientific and technical testing, training of technical manpower, certification of products, standardization activities and industrial research.

3. THE STATE-OF-THE-ART OF COMMERCIALIZATION OF RESEARCH RESULTS

Malaysia's prime concern in the pre take-off period to industrialization was in the development of its primary resources in the areas of improving quality and yield of the primary products rather than development of downstream processing of such products. However, today with the changing emphasis towards developing resource-based industries there is greater concern for secondary manufacture of primary products. Thus priority was given by the government to encourage investment and joint ventures in the country, mainly aimed at encouraging the development of import substitution and high value-added agro-based industries.

As emphasized by the historical background and development of the establishment of government backed R & D institutions in Malaysia, it is obvious that the major portion of R & D activities was targetted to primary agricultural product development and the end-users of the research results of the institutes were clearly identified and were reachable directly through the extension facilities available through the agencies responsible for the development of the sectors. Therefore the main activities of these research institutes at that time was concentrated on the transfer of research results to the targetted groups with little emphasis on commercial exploitation of such results. To a great extent this still holds till today. Furthermore institutions like RRIM, PORIM which are funded by cess drawn on their products are committed to make available their research results to the

contributors of the cess which is collected for R & D activities in the institutes.

Most of MARDI's research results are geared towards the agricultural sector especially to the small scale farmers to enable them to diversify into the cultivation of various crops and increase their productivity, to satisfy the socio-economic target of the New Economic Policy of the country i.e. namely the eradication of poverty and the equitable distribution of income.

With the industrial thrust in the country emphasizing the shift from basic agricultural activities to industrialization and mass production, research institutes are now concentrating more on the industrial type research. The strategy for encouraging resource-based industries will involve emphasis in secondary processing of the primary products and the development of value-added end products. With the introduction of mass production techniques, problems of adaptation of the newly acquired technology are becoming prominent. Applied research is now being carried out by institutes such as SIRIM whose main emphasis is on manufacturing technology and facilitates the adoption, adaptation and modification of imported technologies to suit local conditions. Research institutes like PORIM, RRIM, FRI and MARDI are also giving emphasis to this issue. In view of the shift from activities supporting agricultural production to those supporting secondary and manufacturing sectors, research institutes are now finding that the extension services and technology transfer activities are not adequate for effective technology transfer and should be augmented by employment of

commercialization concepts. The application of this concept of commercialization of research results will provide the means for rationalization of the links between the research institutes and industry. The essential linkages that are required for commercialization of research findings will entail the setting up of mechanisms to facilitate:-

(1) finding partners from the industry to sponsor research in R & D institutes;

(2) identifying research projects that are industrially applicable and demand orientated;

(3) accentuating on pilot plant feasibility studies and ironing out bottlenecks in manufacturing technologies;

(4) providing for further development of research findings;

(5) looking into the protection of invention through patenting and the need to encourage licensing and other contractual arrangements.

Attention is also given to new methods of identifying research areas that can result in technology appropriate for use in the country.

Although there is a general awareness by research institutes that they should go into commercialization of research results, presently the mechanisms for commercialization of research results in the country are not developed yet, though these institutes have been playing a very prominent role in transferring the technology

by extension and information dissemination through publication of research results in the past and have achieved success in enhancing agricultural production. This is seen by the achievements that the country has made in the production of rubber and palm oil making Malaysia a major supplier of these commodities.

This awareness of the importance of commercialization of research findings by the Ministry of Science, Technology and Environment is translated into the incorporation of a mechanism for commercialization of research results by the Standards and Industrial Research Institute of Malaysia (SIRIM). This is a pioneer approach towards resolving difficulties existing in SIRIM to effectively exploit its readily available research results into commercially viable enterprises. SIRIM has been an industrial research institute since 1975 and it is involved in numerous research projects. Its main channel of transferring of technology has been through consultancy services and publications and dissemination of research results to the industry. Though the transfer of research results from joint research activities has not been faced with problems of seeing these research results realized into commercial exploitation, SIRIM does face the problem of commercialization of research results from in-house projects which have been undertaken and which are awaiting for exploitation. These in-house research projects are identified by the Research Committee comprising representatives from government institutions and ministries and the private sector. Such research are solely financed by government

grants or through the institute's annual budget or bilateral or multilateral technical assistance. These research results are generally extended to the industries and relevant government agencies through information dissemination and publication of research results and through extension and consultancy services, of SIRIM to the small and medium scale industries. Most of these research results do not go through the normal stage of pilot plant studies and new processes or projects are not fully tested for their commercial viability. A severe limitation in the application of research results is the absence of available funds for carrying out of pilot plant scale studies and trial production runs to test and evaluate the commercial viability of such projects. The institute currently provides industry with technical consultancy services at nominal charges as the only system for extending the results of its research. A recent study by the institute on the factors that influence the industries' reluctance to take up research findings are:-

(1) high risk that will be faced by the industries that take up the research results which have not been tested through the pilot plant stage;

(2) there is little financial assistance to sponsor the take up of such research;

(3) the absence of specific incentives to encourage industries to venture into new technological areas so developed;

(4) the lack of thorough techno-economic feasibility studies before the research projects are conducted;

(5) arising from a wide and diversified industrial base it is difficult to identify and match the industrial client or user for the research. This is due to a lack of a mechanism to link the research findings and the services provided by the institute to the appropriate industries;

(6) research results of the institute are not protected by patents and there is no contractual or licensing provision in the activities of the institute to guarantee that the entrepreneur who is successful in the exploitation of the research results will be protected.

These are the major factors that have led to the reluctance of entrepreneurs to exploit the research results of the institute. Faced with these problems it has been proposed that SIRIM establishes a commercialization unit that will enable the industry to have easy access to technological developments. The commercialization unit will have the following functions and objectives:-

(1) to ensure that research findings are properly documented and patented, if necessary, for commercial transfer to industry;

(2) to act as a body which administers the licensing of research findings to the industry;

(3) to encourage industry to sponsor pilot plant studies with proposals to government to give incentives on expenses incurred;

(4) to have closer rapport with industry to ensure that research projects selected will be oriented to problem solving of industries needs;

(5) to promote the utilization of new indigenous technologies contributed by SIRIM;

(6) to undertake drawing up of joint research contracts and to establish technical cooperation with local or foreign bodies;

(7) to provide information and advisory services to industry on choice of technology;

(8) to establish close relationship with other research bodies and act as a technology transfer agent.

With the implementation of the above it is hoped that the links between SIRIM and the industry will be strengthened and that research activities will be geared towards industrial needs and commercial exploitation.

4. IDENTIFICATION OF COMMON BOTTLENECKS IN THE PROCESS OF COMMERCIALIZATION OF RESEARCH RESULTS

The main problem of commercialization of research results lies with the traditional practice of research institutions that leave the development of research results to the extension unit or to consultancy services whenever there are enquiries from the potential technology users. On the national level even though over the past years commercialization of research results have been discussed, however the reorientation of research institutions' activities from that of basically transferring technology which are results of research to that of actually earning revenues from such research results from licensing is still a new approach.

Furthermore there are various bottlenecks at the national level that hinder actual commercialization of research results such as

(1) the national economic policy and guidelines stress on the need to help the development of small scale farmers and the small and medium scale industries. Research projects are mainly concentrated on complementing such an objective as small scale industry and small scale farmers do not possess the necessary resources to finance research and the government has to give them a helping hand. Therefore as a matter of fact the research results are fully utilized for technology transfer to these targetted groups though there is little economic returns to the institute. Large capital-based industries in the country and plantations are supported by their own research activities and are able to tailor their research direction to satisfy their own needs. Therefore multinational companies do not have the pressing need to take up R & D locally and usually are not interested in entering into joint research activities by making use of facilities of the local research institutes. Furthermore there is easy access to foreign technology and favourable fiscal encouragement by the government to importation of technology by those that can afford to buy such technologies. Therefore medium scale and large scale industries prefer to import technologies and technological packages from abroad rather than to join hands with the governmental R & D institutes to go into research. One major bottleneck

in the generation of local technology and its dissemination to industries is that many transnational companies and large industrialists have a preference for purchasing directly complete packaged technology or to enter into a turn key type project agreement. Such an approach would provide an easier accessibility to proven technology in which the major risk factors have been eliminated, although at a very high purchase cost. This therefore makes it difficult for local research institutes to influence the industrialists to undertake specific projects which are aimed at improving or developing parts of processes or systems, as the general practice is towards accepting complete manufacturing systems in the package i.e. design, machinery, process and including franchise.

(2) Commercial banks and financial institutions in the country are not required to give soft loans or incentives to entrepreneurs venturing into the commercial development of research results which by nature are of high risk to the entrepreneurs. Though research institutions provide technical expertise and guidance for potential users of the research results, these institutions are not usually involved in the development of their own research results and the involvement of such research institutes are not specified in the functions of the institutes. Development of research results into actual application is either left to government agencies or ministries in charge of the research institutes through their own extension units which have direct linkages to the industry. In the case of the

Ministry of Agriculture, the Agriculture Department has been successful in translating the research results into practical applications of most of the agricultural research institutes. However, in the case of industrial research results there is an absence of a transfer agent with the necessary linkages to the appropriate industries.

As explained earlier much of the research carried out by research institutes is mainly directed to small scale industries which have low absorptive capabilities because they have no technical expertise and wherewithall and the transfer of research results to such groups require the interplay of other supporting facilities and developing of other mechanisms.

(3) The patent system in the country which is based on the re-registration of patents already granted by the United Kingdom is a hindrance to the development of R & D activities in the country. Local inventions have to undergo the expensive and burdensome procedures of applying for patents in the United Kingdom first before this patent can be re-registered in Malaysia. Most research institutions prefer to publish the results of research rather than to go through the expense of patenting the research results. In 1980 less than 2% of the applications for re-registering of patents in the country were from local applicants.

(4) Results of industrial research projects have to be subjected to trial production runs or pilot plant phase in order to cut down the risk factor before commercialization. Research

institutions are usually restricted by budgetary allocations from going into the trail production run phase or pilot plant phase. Therefore entrepreneurs generally are reluctant to take up the projects.

5. WAYS AND MEANS TO COPE WITH THE BOTTLENECKS

With the emphasis of the industrialization thrust it is imperative that research organizations concentrate on buying technology and devising effective and efficient mechanisms for the transfer of such technologies directly to the industry. It is also necessary that industries be prepared to readily absorb the new technology.

On the national level the shift in emphasis into applied technological research has been given recognition by the Ministry of Science, Technology and Environment, the National Science Council and the Coordinating Council for Industrial Technology Transfer whereby the necessary infrastructure and plans to enhance this move by the research institutes are being developed. These include:-

(1) the formulation of the National Technology Transfer Policy to enable the identification of priority industrial sectors and the role of technical research institutes towards the development of the priority industries and the necessary mechanisms that should be established or strengthened to support the transfer of research results from such institutes.

(2) the formulation of the National Science Policy to identify appropriate research areas to cater for the present development

of the industrial sector and also to anticipate its future growth.

(3) the establishment of technology information system and network with the initial setting up of a Patent Information and Documentation Centre (PIDC) in SIRIM to strengthen technology bargaining power and choice of technology by the industry and also to give new direction to research projects by providing information on available research results and state-of-the-art of patented technologies. It is intended that the PIDC will be the basis for the establishment of a national technology information network.

(4) the setting up of an infrastructure for commercialization of research results in SIRIM as an initial step towards the encouragement of the setting up of similar mechanisms in other research institutes.

(5) the recognition of the need to set up a Technology Transfer Centre as a clearing house at national level for the promotion, dissemination and transfer of indigenous and imported technologies to the industrial sector, supported by the development of specific technology resource centres such as MITEC, MIRDC of SIRIM and other identified sectors to cater for priority or targetted industries identified under the Industrial Master Plan.

(6) the establishment of an indigenous industrial property system in the country to supersede the former system of re-registration of industrial property will help to encourage research institutes to apply for patents at the most economical cost and facilitate the speeding up of patenting procedure for local applications, thereby increasing local innovative spirit. It is hoped that with this new patent system the research results will be better protected thereby encouraging licensing and contractual procedures between research organizations and the targetted priority sectors for purposes of enhancing commercial development of research results.

6. LONG TERM STRATEGIES FOR COMMERCIALIZATION OF RESEARCH RESULTS

One long term strategy for the commercialization of research results is the development of technology transfer corporations to provide package transfer of technology to the small and medium industries in Malaysia. In view of the plans and strategies that are being devised by the government to encourage commercialization on the short term, commercialization activities are only concentrated in research institutions. However, there has been discussions on the long term plans for commercialization of research results in the country. One of the current proposals that is being examined by the National Council for Scientific Research and Development is the establishment of a body incorporate with linkages to the various research institutes and the industries to facilitate the transfer of such research

results efficiently. This type of technology transfer corporation would mainlybe limited to the transfer of technology packages and therefore concentrate on imported technology which is adopted for local application.

As a result of government's current strategies to strengthen the activities of research institutes to develop commercialization of research results, it is envisaged that in the long term various strategies would need to be adopted such as:-

(1) the setting up at national level a technology transfer corporation to serve as a focal point and clearing house for both indigenous technologies and imported technologies that are modified and adapted by local research institutes into a package suitable for easy translation into commercially viable undertaking. Technical support will be given by the research institutes in Malaysia to this corporation and the function of this corporation will be to set up companies in joint venture with the industries utilizing the newly acquired technology.

(2) In view of the low absorptive capability of the small and sometimes medium scale industry, research institutes will have to strengthen their technical consultancy services and training facilities with the objective of upgrading the technical skills of these industries. This can be initiated by the implementation of industry adoption schemes whereby companies are assisted on an integrated basis to acquire new technology and develop their know-how at the management, process and product development levels.

(3) Devising a firancial support infrastructure for soft loans and other financial incentives to encourage industry to upgrade and modernize their facilities by using the latest technologies developed.

(4) To encourage industries (especially the small scale industries) which do not have readily available research facilities, to organize themselves into specific industrial groups (e.g. Industry Research Associations). These groups will be organized along common frontiers, to bring together the common technical problems faced by these industries, and which can cooperate to sponsor research to solve these problems. These may jointly refer to the facilities available at government research institutes to assist them to overcome their common problems. Finance for these research activities will be funded by joint contributions by these groups.

7. CONCLUSION

To summarise, I would like to reiterate that Malaysia previously focussed its attention more on the research of its primary industries and the extension of these research findings to the industries for direct implementation and not for commercial exploitation as such. However, in the course of industrialization and economic progress. these extension and consultancy services have been found to be inadequate and the need for commercialization of research findings have been acknowledged. Recently the government has drawn up new plans and policies to assist commercialization of research findings and technology and hope that in the next few years this commercialization of research results would be realized.